

Industrial Organization Theory and Development Economics

KAUSHIK BASU*

THE AGENDA

There are two broad ways in which industrial organization and development economics relate to each other. First, industrial organization, being more advanced in terms of techniques of analysis, provides a readymade box of tools for some branches of economics relevant to developing societies. This potential is increasingly recognized and there is an emergent literature, which applies ideas from game theory and industrial organization to problems of agrarian relations (see, for example Bell, 1989; Dutta, et al., 1989; Basu and Bell, 1991), international debt modelling (see Bulow and Rogoff, 1989; Basu, 1991; Deshpande, 1994), technology transfer and trade (Marjit, 1990; Kabiraj and Marjit, 1993), and other fields. In some cases the availability of these instruments of analysis have actually influenced the research agenda.

Secondly, industrial organization in the context of a developing nation raises issues and concerns which are, frequently, distinct from those raised in industrialized nations. Thus, there is a case for constructing industrial organization models *for* developing nations. In India, research on agricultural economics has raised a variety of novel theoretical issues which have led to the creation of new concepts, categories and theories. An example is 'factor-market interlinkage'. Micro-empirical studies of Indian agrarian relations (e.g. Bardhan and Rudra, 1978) suggested that in backward agrarian markets the contracts struck between agents in different markets were often interlinked. Thus, a labourer may agree to work for a landlord

* I would like to thank Arghya Ghose and Dilip Mookherjee for comments and suggestions.

subject to his being able to get credit from the landlord when the need arises, thereby interlinking the labour and credit markets.

Unfortunately, the literature—both empirical and theoretical—on industry in developing countries has not been equally enlightening. Thus, in India a student of economics goes through models of oligopoly and studies inter-firm interaction, paying scant respect to the fact that the strategic thinking that goes on in Indian industry is not so much between firms as between the firm and the government. That is, the game is often between the *boxwallah* and the *babu*. Yet the modelling of such interactions has been woefully meagre. While there is now an emerging literature on macro-industrialization issues (e.g. Ahluwalia, 1985), micro studies are still in their nascency.

Similarly, in India students study sophisticated models of entry deterrence where firms use limit pricing, excess capacity or capital precommitments as instruments to ward off potential competitors (see, for example, Dixit, 1980; Basu and Singh, 1990). Experience suggests that in India incumbent firms usually deter entry by influencing government policy and decisions. Until recently, before investing every prospective investor was expected to seek the prior approval of the Ministry of Industry; before importing capital goods, he had to obtain a licence from the Chief Controller of Imports and Exports; before raising funds for his project, he needed permission from the Controller of Capital Issues in the Ministry of Finance; before actually starting production, he had again to go to the Ministry of Industry to obtain an industrial licence (Mohan, 1992).¹ An influential incumbent could tactfully lobby with the government at any of these stages and prevent the entry of rivals. So if one were to study entry-deterrence in India one would have to analyse how deterrence can be achieved by using the government as a mediator. The absence of such analyses shows that the industrial economics taught in India has not been adequately rooted in the Indian context.

This paper does not try to fill the lacunae in the literature by developing any new theory. It tries to provide an overview of the links between industrial economics and the concerns of developing economies. Instead of presenting a sweeping survey, I take up a few illustrative examples

¹ Somewhat more surprisingly, closing down a firm in India can be as riddled with bureaucracy as opening a firm. Though I do not go into problems of exit here, this is a growing concern among Indian economists (see Goswami Committee Report 1993).

The stage having been set, I go on to illustrate how modern *methods* of industrial economics can be applied to issues of special interest to less developed countries. First, the important idea of interlinkage, which emerged out of the development literature, is explained in terms of the theory of non-linear pricing in industry. This has important implications for the drafting and execution of antitrust legislation (which has not been fully grasped by the lawmaker, and perhaps, also the economist) which are then discussed. Next, I describe 'market fragmentation' which is the heart of the problem of markets in less developed economies (Bardhan, 1984). In constructing models of fragmented markets it is, however, not necessary to start from scratch. As has been shown in Basu and Bell (1991) (see also, Mishra, 1995), the recent literature on switching costs in industrial economics provides a readymade structure which can be adapted easily for analysing market fragmentation.

The penultimate section picks up the neglected theme of strategic interaction between the *babu* and the *boxwallah*, mentioned at the outset of this chapter. I recount some of the initial research efforts in this area and emphasize themes which need further analysis. The final section concludes the discussion.

One consequence of the paucity in India of indigenous theoretical advances in industrial economics is that the quality of legislation pertaining to industry, and more generally, economic activity leaves much to be desired. Whereas the legislative aspects are carefully drafted, there has been no effort to ensure that the laws promote economic efficiency, growth, and even equity. The impact on efficiency and equity of a new legislation, after all the dust settles and the economy reaches an equilibrium, may be very different from what is the immediate impact of a new law. To understand the former requires familiarity with the principles of economics. It is not surprising that despite so much sound and fury India's record on the fronts of both efficiency and equity remains poor. Fortunately, as a consequence of the government's announcement of a New Industrial Policy on 24 July 1991 and the continuing economic reforms in India, awareness has begun to build up that the success of the reforms requires us to rewrite some of our laws pertaining to industry and labour.² Throughout this paper I weave in comments on economic

² For a survey of the literature on industry and industrial reform spawned by the recent structural adjustment policy in India, see Joseph (1994).

from the literature and then go on to highlight some open problems and issues.

Industrial organization has been one of the fastest growth areas of economics during the last one or two decades. As the theory of extensive-form games advanced, so did industrial economics which has increasingly been founded on game theory. What often gets overlooked is that in industrial economies both theory *and* empirical research have progressed in tandem, providing nourishment for each other. Much of the early motivation for theoretical work came from the empirical studies of the 'American school', best characterized by the work of Bain (1956). And in recent years there has once again been a revival of empirical research (see surveys by Schmalensee, 1989; and Bresnahan, 1989). However, the empirical research is almost entirely rooted in the experience of industrialized nations.

One major fall-out of this has been that economists in industrialized nations have been involved in practical, real-world issues like industrial legislation and industrial policy making. In India, on the other hand, the drafting and execution of laws concerning industry have been left to lawyers and public personalities, in general. This is true for, for instance, the Monopolies and Restrictive Trade Practices Act (MRTP) 1969, or the Foreign Exchange Regulation Act (FERA) 1973, as is evident even on a cursory reading of these Acts.

All these suggest that the scope for research in the area of industrial organization in the context of developing economies is enormous. The purpose of this chapter is to give the reader a glimpse of this scope, and to provide an agenda for research.

I shall begin by discussing the link between poverty and industrial structure and policy, a link that has generally been overlooked by researchers. In developing countries, poverty has been an important area of research (see Drèze and Sen, 1989, and its bibliography). In industrialized nations, industrial organization is one of the most researched areas within economics. In a recent paper Atkinson (1994) has shown that there is an important link between these two areas. I shall start by sketching Atkinson's model (in the next section) because it illustrates several ideas at one go. It shows how standard industrial organization models, suitably moulded, can be of relevance to the special concerns of developing economies. It also shows how market structure can influence welfare in unusual ways.

legislation in the hope that this will provoke thought and debate in this field and thereby provide some of the intellectual back-up needed for redrafting our industrial laws.

INDUSTRIAL POLICY AND POVERTY

'The poorest people in developing nations lie outside the market' is an observation that one hears often enough. But is it true that at times that market eludes the poor? What market structure is more likely to do this? Atkinson's (1994) recent analysis illustrates how one can get some answers to these questions by suitably adapting some fairly standard models of industrial economics (e.g. Gabszewicz and Thisse 1979; Shaked and Sutton 1983).

To understand Atkinson's model, suppose there are workers whose marginal productivity (I shall refer to this as *natural wage*) ranges from \underline{w} up to \bar{w} , where $\bar{w} > \underline{w}$. The workers are uniformly distributed on $[\underline{w}, \bar{w}]$. Assume that there are $\bar{w} - \underline{w}$ workers. Productivity being the only distinguishing mark of a worker, I shall refer to a worker by his productivity.

Assume that if a person $w \in [\underline{w}, \bar{w}]$ could buy a bicycle, his wage earned would rise from w to $(1+h)w$, where $h > 0$. Figure 1 illustrates a line, OH which represents w multiplied by h .

Hence, if a cycle costs p units, only those individuals w such that $hw \geq p$, will buy cycles.

Suppose the cost of producing a cycle is c . If $h\underline{w} < c$ then it is not worth providing cycles to some individuals. But this exclusion happens in an obvious way. In order to focus on the more interesting case, I shall throughout assume that $h\underline{w} > c$.

This is the case illustrated in Figure 1.

Consider first the case of perfect competition in the cycle market. The price of a cycle would drop to c and all $\bar{w} - \underline{w}$ individuals would get to own a cycle.

Next consider a monopolist manufacturer of bicycles who has to set one price for all his customers. It is immediately obvious from Figure 1 that the monopolist will set price, p^* , as follows:

$$p^* = c + \frac{1}{2} (h\bar{w} - c) = \frac{1}{2} (h\bar{w} + c)$$

Let w^* be the critical natural wage such that exactly those below w^* are excluded from the market. Then,

$$w^* = \frac{p^*}{h} = \frac{1}{2} \left(\bar{w} + \frac{c}{h} \right)$$

It is instructive now to do some comparative statics exercises. Suppose a group of $\bar{\bar{w}} - \bar{w}$ (>0) rich migrants come into this society, whose natural wage varies uniformly from \bar{w} to $\bar{\bar{w}}$. What happens to the local people? Clearly the critical wage w^* now rises to $(1/2)(\bar{\bar{w}} + c/h)$. Hence, more local people are now excluded from the cycle market and, therefore, remain impoverished.

The model can be given more structure and subjected to more analysis (see Atkinson 1994). Instead of pursuing that line here, let me draw the reader's attention to one interesting feature. Suppose the monopolist is allowed to freely discriminate between buyers. I have called such a monopolist an *extortionate monopolist* in Basu (1984). Then it will be in the interest of the monopolist to charge consumer w a price of hw . His profit will be $KLMG$ and no consumer would be excluded from the market. Hence, an extortionate monopoly and a competitive industry share a common feature—they do not exclude consumers from the market or, to state it more generally so as to apply to cases where $hw < c$, they do not exclude any customer who values the good more than the marginal cost of production.

This gives us a lead into the subject matter of the next section which is concerned with non-linear pricing and extortionate monopolies. This is of general interest to developing economies because non-linear pricing is the essential theoretical idea underlying interlinkage.

NON-LINEAR PRICING, INTERLINKAGE AND ANTITRUST

Interlinkages between factor markets have many explanations (see, Braverman and Stiglitz, 1982; Basu, 1987). One view of this, first suggested by Bardhan (1984), is that 'interlinkage' is a form of non-linear pricing, and, hence, standard industrial economics can shed light on this new concept relevant to developing economies.

To understand this, consider an economy with n labourers. Each can produce an output of q units. They have access to a competitive labour market where the prevailing wage equals the marginal product of labour, i.e. q . For credit, however, they can turn to only one landlord. The need for credit arises for many reasons. Here, for the sake of simplicity, it will be assumed that there are two periods and wages are paid in period 2. In period 1 a labourer has to borrow to finance consumption. If a labourer receives a loan of L units in period 1 and has to pay it back in period 2 with interest, at a rate of i , and he gets a wage of w units, his consumption stream in the two periods is given by $(L, w - (1 + i)L)$. The utility that he gets from this is given by:

$$u = u(L, w - (1 + i)L), u_1 > 0, u_2 > 0 \quad (1)$$

The function is assumed to be strictly concave and differentiable. It is being assumed that all workers have the same preference. To find the labourer's demand function for loans we have to solve the following problem:

$$\text{Max}_L u(L, w - (1 + i)L)$$

By solving this we get the amount of loan demanded by a labourer as a function of w and i :

$$L = L(w, i) \quad (2)$$

Now consider the moneylender who has a monopoly in the credit market. It is assumed that he has access to the organized credit market where the interest rate is r . Hence, the opportunity cost to the moneylender of giving credit in the rural sector is r . We shall begin by assuming that the moneylender cannot discriminate between loans in terms of interest rate. He has to fix an interest rate, i , which he cannot then vary across borrowers or loans. If he acts like a traditional monopolist he will, confronted by the demand curve for loans, lend up to the point where the marginal revenue equals the marginal cost of lending which, in this model, is r . He will then set i above r in the usual way.

He can, however, earn a larger profit if he uses his monopoly power in the credit market to offer joint deals in the credit and labour markets. By insisting that a person must be his employee in order to get his credit and

by paying his employees less than the wage rate in the competitive labour market, he can emulate a two-part tariff monopolist and extract the entire surplus from the labourers.

Suppose the moneylender-landlord offers a package, (w, i) . If a worker accepts this he has to work for the landlord for a wage of w and he can take as much credit as he wishes at an interest rate i . Assume the workers accept this package. Then the landlord's profit, π , is given by:

$$\pi(w, i) = n[q - w + (i - r)L(w, i)] \quad (3)$$

Remember that each worker produces q units of output and confronted with (w, i) takes a loan of $L(w, i)$, as specified in equation (3). We shall refer to $n(q - w)$ as the production income, and $n(i - r)L(w, i)$ as the usurious income of the moneylender-landlord.

Note that if a labourer rejects the offer (w, i) , he can always flee to the labour market where he gets a utility of $u(O, q) = \tilde{u}$. This will be referred to as the reservation utility of the labourer. Clearly, then, the landlord, in designing his offer to the labourers, has to ensure that they get at least as much as their reservation utility. Hence, the landlord's problem is:

$$\begin{aligned} & \text{Max } \pi(w, i) \\ & \{w, i\} \end{aligned}$$

subject to $u[L(w, i), w - (1 + i)L(w, i)] \geq \tilde{u}$.

Solving this we get (w, i) and by using equation (2) we can then solve for L . Let the solution of this exercise be denoted by $(w^*, i^*, L^*) = E^*$. E^* is, therefore, the equilibrium in this model.

A geometric characterization of E^* is easy using a technique developed in Basu (1987). First check that in Figure 2, we may treat the worker's reservation indifference curve, qe , as the landlord's total revenue curve with the figure turned upside down. To see this, suppose the moneylender-landlord offers a loan of L units in period 1. Then the maximum money that he can take away in period 2 is clear eL' . Otherwise the labourer would reject the landlord's offer. Hence, the revenue earned by lending L is eL' . If he lends L units to a labourer, the cost of this is $(1 + r)L$. Hence, if we draw a line through q with slope $1 + r$, we could think of it as the total cost curve facing the landlord. His optimum is given by point e where the slope of the reservation indifference curve equals $1 + r$. Hence, the landlord should offer a wage of w (see Figure 2), and set i equal to r . His

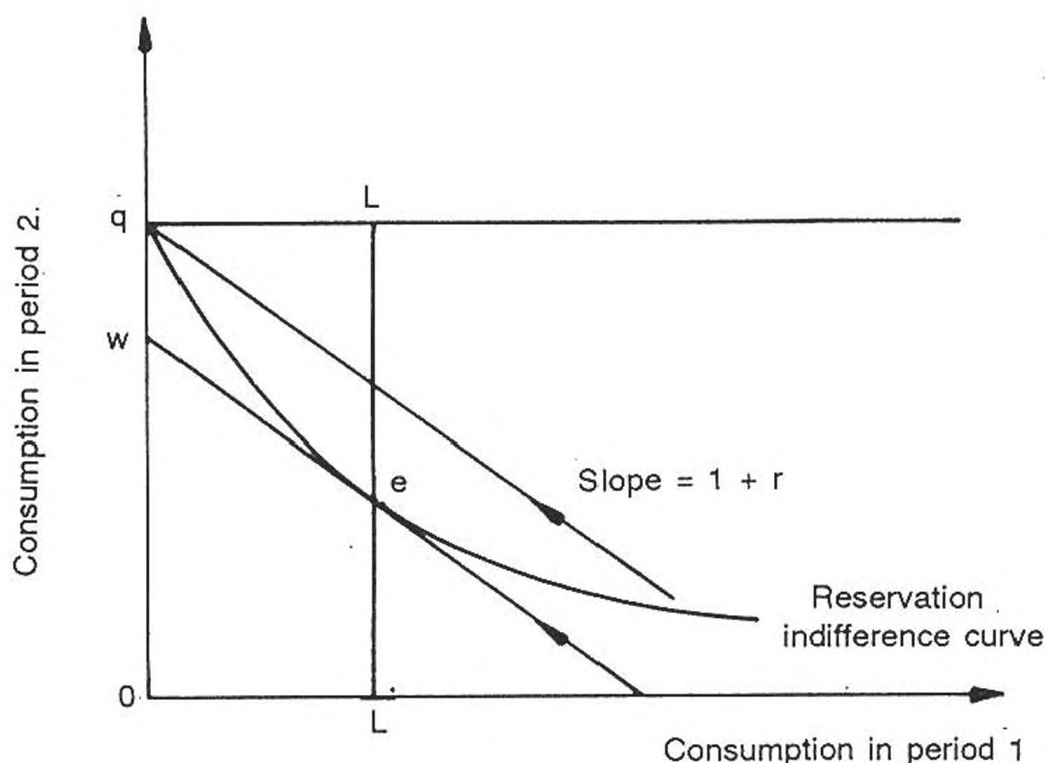


Figure 2

profit from each labourer is given by qw , and his total profit is this quantity multiplied by n .

Viewed in this manner several standard theorems on interlinkage are easily understood. In this model all labourers get the same utility, and each labourer gets as much utility as he would have got if he did not transact with the monopolist–moneylender and went to the labour market instead. The only difference is that he would be at point e in one case and q in the other. This is known in the literature as the ‘utility equivalence theorem’.

Let us define the rural interest rate as *usurious* if i exceeds r . Note that in this simple model the landlord did not charge usurious interest rates. However, this should not be equated with an absence of ‘exploitation’, for this landlord extracts more from the labourers than a traditional monopolist–moneylender.

In this model, interlinkage is an outcome of monopoly in one market. Interlinkage enables the landlord to extract the consumer’s surplus from those who take credit from him, or to use legal jargon (Bowman, 1957), it enables him to exercise ‘leverage’. In some of the early literature on the subject, and occasionally even now (Wharton, 1962; Bhardwaj, 1974), it has been argued that interlinkage gives landlords greater power than

monopoly. For a model like the one just discussed, this is an ambiguous observation because whatever earnings of the landlord can be attributed to interlinkage can, in turn, be attributed to monopoly.

We have, thus, shown that if the lender is perfectly extortionate (i.e. he is able to extract the entire consumer's surplus of each borrower above the reservation utility), then the interest rate will be non-usurious. Further, in this case the market outcome can be shown to be Pareto efficient. This is an important property with significant implications for the drafting of antitrust law. Hence, it is a claim that is worth proving formally. But before doing so let me quickly clarify what is *non-linear* about the pricing scheme used by the moneylender-landlord. If a consumer faces a fixed price per unit so that for buying n units he has to spend n times what he has to spend to buy one unit, then we say that he faces a linear price schedule.

In Figure 3, the line OA depicts a linear price schedule. A non-linear pricing scheme is—pardon me if there is no surprise in this—any price schedule which is not linear. Line OB depicts a non-linear price schedule where to buy $2n$ units costs less than twice as much as for n units.

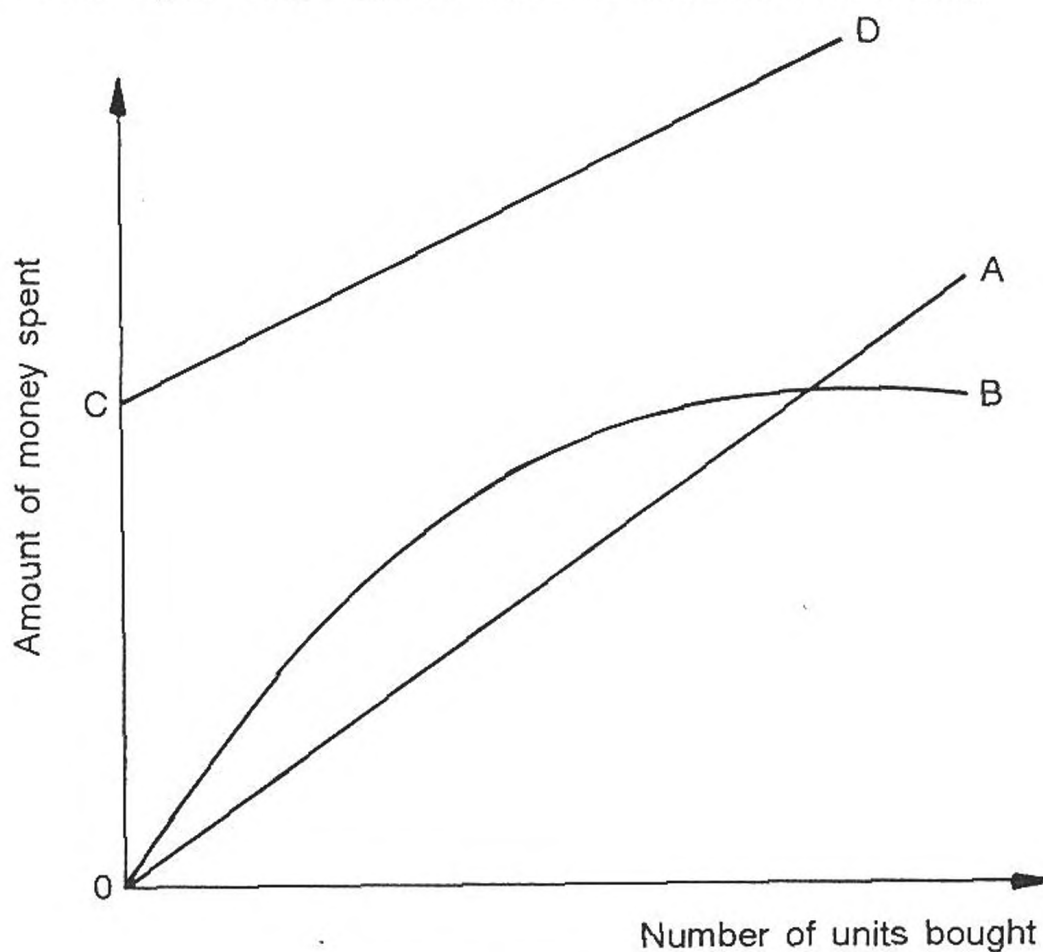


Figure 3

Why is the interlinked credit market an example of non-linear pricing? Suppose that the horizontal axis in Figure 3 represents the number of units of credit taken by the borrower. Note that in this scheme to be able to borrow *anything* the borrower must first take a cut in wage (thus, he has to pay an entry fee), and then he can borrow as much as he wishes at a fixed interest rate. Hence, the price schedule consists of the point 0 and then the line CD. It is discontinuous at 0 and is, therefore, a case of non-linear pricing.

ANTITRUST LEGISLATION AND ECONOMIC EFFICIENCY

Let me now return to the issue of monopoly equilibrium and Pareto efficiency. This is at the same time simple and widely misunderstood. Indeed, a considerable amount of policy-making and the drafting and implementation of antitrust legislation has been marred by such misunderstandings.

Most countries have enacted antitrust laws in some form or the other. With its Sherman Act (1890), Clayton Act (1914), Robinson-Patman Act (1936), and many more, the US has some of the most sophisticated legislation for deterring monopoly and encouraging competition. In Britain the first legislation against monopolistic industrial practices was enacted by the Labour government in 1948 when it passed the Monopolies and Restrictive Practices (Inquiry and Control) Act. Under this act the Monopolies and Restrictive Practices Commission was established. Its powers are more limited than the US Federal Trade Commission because it has no power to *initiate* an inquiry (for discussion, see, e.g. Guenault and Jackson, 1960; Rowley, 1966). In India, the Monopolies and Restrictive Trade Practices Act 1969, is the main legislation for the control of monopolistic practices, though its efficacy has often been questioned (see, e.g. Chandra, 1977; Paranjape, 1986). Nevertheless, the *motivation* behind the British and the Indian acts is very similar to the antitrust laws of the US. The basic motivation comes from a belief that monopoly is generally inefficient. Interestingly, this belief existed even before any reasonable analysis of monopoly was available.

Drawing on my recent work (Basu 1993), let me show that though some forms of monopoly are inefficient (in the sense of leading to Pareto sub-optimal equilibria), the most extortionate forms of monopoly are not

inefficient. This is paradoxical at first sight; and it is not surprising that lawyers have not appreciated it. Since antitrust laws try to prevent some of the most extortionate practices associated with monopolies, this claim would simply mean that such laws cannot be justified on grounds of efficiency. The justification would have to lie in equity and fairness.

Let me begin by demonstrating why the standard, textbook monopolist is indeed inefficient. To do this formally we need to use a general equilibrium model. The simplest model for such an analysis is a two-by-two, pure-exchange economy in which the entire initial endowment of good X is owned by Agent 1 and the entire endowment of Y belongs to 2. Agent 2 is a monopolist; so he sets the price. Agent 1 is a competitor (we could also think of Agent 1 being actually a group of a large number of identical consumers), which essentially means that he is a price-taker.

Much of this information is depicted in the Edgeworth box shown in Figure 4. The endowment point is e and Agent 1's offer curve is eE . A traditional monopolist will clearly set price so that the budget constraint of Agent 1 is eA . Hence, equilibrium occurs at B , where Agent 2's

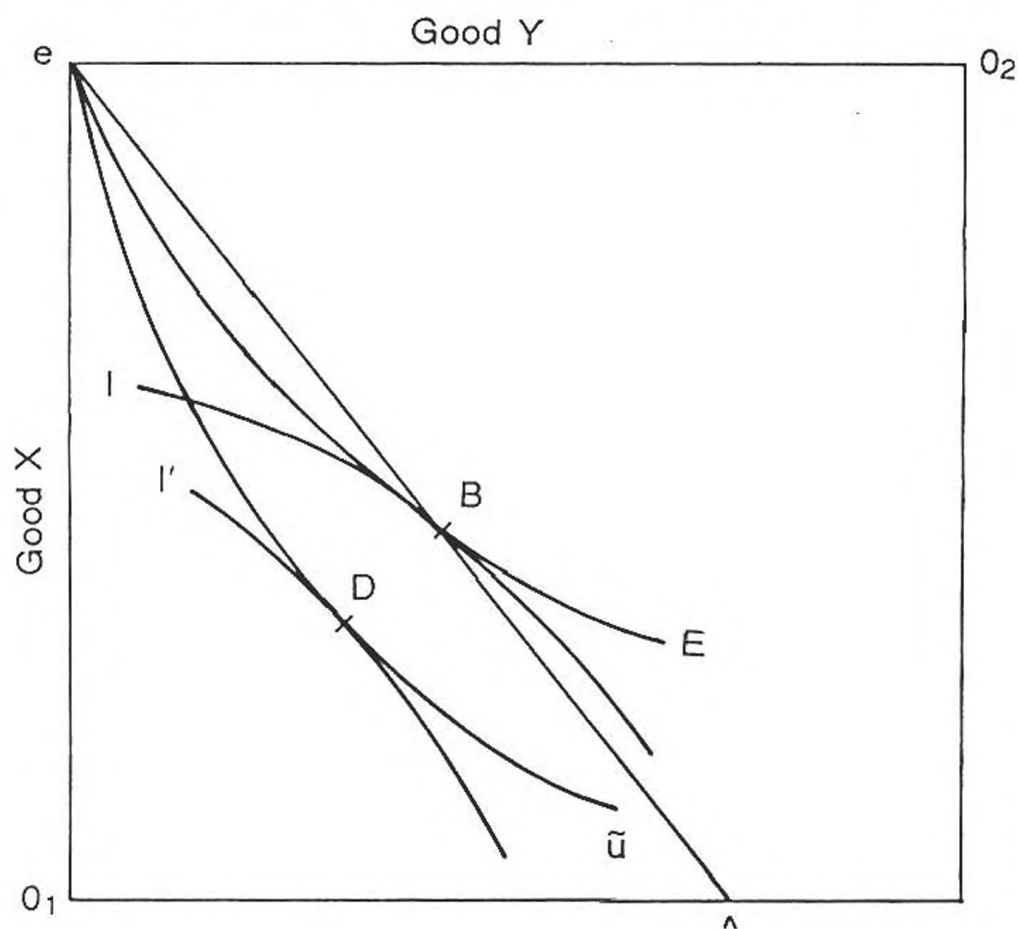


Figure 4

indifference curve, I , is tangential to the offer curve. B is clearly a Pareto sub-optimal point. Hence, a traditional monopoly indeed leads to inefficiency. This explains the basis of the resentment against monopoly.

However, as we have already seen, the traditional, textbook monopolist is a fairly philanthropic character in relation to the possibilities open to him. So let us check the welfare properties of an extortionate monopolist. Let me here interpret an extortionate monopolist not simply as someone charging a two-part tariff but, more generally as a monopolist who extorts all the consumer's surplus from Agent 1—perhaps by making a take-it-or-leave-it offer. In other words, the extortionate monopolist never makes an offer better than the minimum acceptable to Agent 1. Hence, he chooses a point on $e\tilde{u}$, which is 1's indifference curve going through point e . From 2's point of view the best point on $e\tilde{u}$ is D , where 2's indifference curve, I' , is tangential to $e\tilde{u}$. Agent 2 can attain this equilibrium through several mechanisms, such as the two-part tariff discussed in the previous section or take-it-or-leave-it offers which entail a deal such as 'give me so many units of good A and I will give you so many units of B and if you do not accept this deal then we do not trade at all'.

Quite obviously D lies on the contract curve (not shown) in the Edgeworth box and is a Pareto optimal point. So if a monopolist becomes more extortionate, the equilibrium changes from being sub-optimal to optimal (i.e. point B to point D). Hence, extortionate monopolistic practices should not be ruled out by law on grounds of their creating inefficiencies—or at least such an argument would require us to conjure up much more sophisticated scenarios. At this stage it seems that any justification for antitrust policies has to be based on grounds of equity. This is not impossible to construct because in the efficient monopoly equilibrium, that is, at D , the competitive buyers are exactly as well off as at e . Trade with the monopolist confers no benefit on them. Pareto optimality is achieved by the monopolist appropriating the entire benefit from trade. This, some may argue, is evidence of lack of fairness in trade.

I have here stayed away from considerations of dynamic efficiency. The above conclusion, for instance, can be reinforced by arguing that once we bring in innovations and long-run profits, the price-discriminating monopolist may invest even more because he can capture all the rents from an innovation. While information constraints may prevent him from acting like a *perfect* discriminator, he still has an advantage over

competitive firms which have no power to extricate rents. However, the argument in the dynamic case gets complicated once we bring in the possibility of adverse selection. In such a case the efficiency of a monopolist could depend critically on the nature of property rights conferred by the nation's laws (Basu, 1989; Singh, 1994). A second complication arises if instead of considering a monopoly we analyse an oligopoly and vary the number of firms to check the effects of concentration on innovation. The answers become extremely sensitive to the assumptions and no one-line conclusion is possible (Loury, 1979; Reinganum, 1989).

The Indian antitrust legislation, as embodied in MRTP 1969, distinguishes between monopolistic and restrictive trade practices.³ As in the case of America's Robinson-Patman Act 1936, our MRTP rules out certain kinds of non-linear pricing schemes on the ground that these are restrictive trade practices. In the light of our analysis we should recognize that monopolistic practices create inefficiencies; but these inefficiencies do not necessarily get exacerbated by allowing monopolists to indulge in certain restrictive practices which are open to them by virtue of their monopoly power. In fact some of these practices, like non-linear pricing may actually increase efficiency. Thus, if such practices are to be prevented by law this cannot be justified on the usual ground of monopolistic inefficiency.

FRAGMENTED MARKETS AND SWITCHING COSTS

The efficiency of markets depends a lot on the ability of goods and services to flow freely from one region to another and between agents. Yet for more than one reason such flows may be restricted not only between countries because of tariffs and transportation costs but also within a country, because of market 'fragmentation'. An important and well-known reason why markets in developing countries are even more far removed from the ideal world of perfect competition than markets in industrialized countries is that these are allegedly 'fragmented'. To understand the nature of such fragmentation is an important step towards policy changes which enables a freer flow of goods and services.

³ A large part of it was also concerned with the size of firms, and placed obstructions on the growth in size. This has, however, now been deleted as per the ordinance of 1992.

What is often not appreciated is that while markets can be fragmented because of lack of information or natural switching costs, it can also be the outcome of the absence of an effective law for enforcing contracts. One reason why a rural landlord would not lend money to an unknown person, and an urban landlord hesitates to rent his apartment for a limited duration to an unknown person is that neither can be sure of being able to prevent default or a renegeing on the terms of the contract. The rural borrower may not repay the loan and the urban tenant may not quit. In brief, these people hesitate to transact outside a limited circle of friends and acquaintances or friends of friends. The upshot is a fragmented market. But before one can talk of laws for correcting this, it is important to understand exactly what market fragmentation means. How can we model it and subject it to closer scrutiny and empirical analysis? This section attempts to answer these questions.

One possibility is to treat a fragmented market as one broken up into several small isolated markets. For want of a better model, this method has been widely used (see for e.g. Bardhan, 1984; Basu, 1987). This reduces to a standard monopoly analysis, where instead of having one monopolist we have to think of a scenario with n monopolistic islands.

It was, however, argued in Basu and Bell (1991) that this is not an accurate formalization of the more complicated idea of fragmentation. Let me first introduce this idea in the abstract. Suppose there are two producers, Agents 1 and 2, who have a fixed clientele or set of potential buyers. Let these sets be, respectively, S_1 and S_2 . This would be rightly described as a case of two monopoly islands if S_1 and S_2 had no overlaps. In reality, S_1 and S_2 may look as in Figure 5 which suggests that there are some people (those in the eclipsed region of the two moons) who have access to both sellers 1 and 2 and there are also people who have access to either only 1 or only 2. This was described as a case of fragmented duopoly.

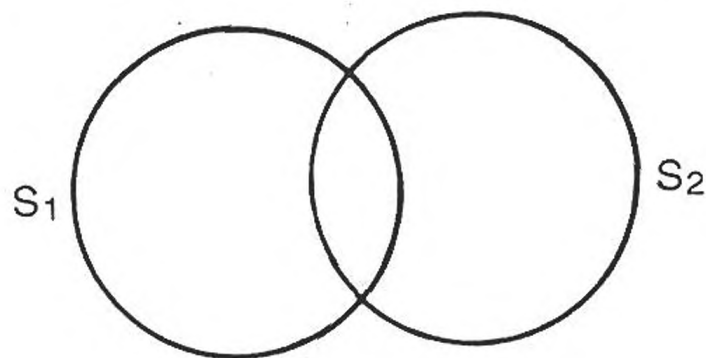


Figure 5

A fragmented duopoly is distinct from a standard duopoly which would require $S_1 = S_2$ or a total eclipse in Figure 5. To analyse a fragmented duopoly we can, however, take a cue from the literature on switching costs (e.g. von Weizsacker, 1984; Klemperer, 1987), since a fragmented duopoly may be conceived of as a model of industry with infinite switching costs.

To give the reader an idea of how fragmented duopolies work let me consider a simple model with n consumers. Each of them has an identical inverse demand function:

$$p = p(x) = a - bx$$

That is, if p is the price of the good then each consumer would demand $x = (a - p)/b$ units. These n consumers are partitioned into three sets, consisting of n_1 , n_2 , and n_3 members. Thus,

$$n_1 + n_2 + n_3 = n$$

The first n_1 buyers have access only to Seller 1, the next n_2 have access only to Seller 2, and those in the last n_3 can go to whichever seller offers better terms. This is called the *contested segment* of a market. The buyers who can buy only from Seller i comprise i 's *captive segment*. Each of the two sellers produces the good at the fixed per-unit cost of c . I shall assume that no price discrimination is possible. The case where sellers can discriminate between the captive and contested buyers is discussed in Basu and Bell (1991).

Clearly firm i 's profit function is given as:

$$\pi_i(q_1, q_2) = \begin{cases} \text{Max}_x [p(x/n_i) - c] x, & \text{if } q_i = 0 \\ [p(q_1 + q_2/n_3) - c] [q_i + (n_i/n_3)(q_1 + q_2)], & \text{if } q_i > 0 \end{cases}$$

where q_i denotes the amount sold by i on the contested segment.

If firm i decides not to sell anything on the contested segment ($q_i = 0$), he simply maximizes his monopoly profit on his captive segment by selling x units of good so as to maximize $[p(x/n_i) - c] x$. If $q_i > 0$, the price on the contested segment is $p[(q_1 + q_2)/n_3]$. Hence, on the captive segment the price is $p[(q_1 + q_2)/n_3]$. Thus, the number of units demanded from him from his captive segment is $(n_i/n_3)(q_1 + q_2)$.

We shall say that (q_1^*, q_2^*) is an *equilibrium* of the fragmented duopoly only if:

$$\pi_1(q_1^*, q_2^*) \geq \pi_1(q_1, q_2^*), \text{ for all } q_1$$

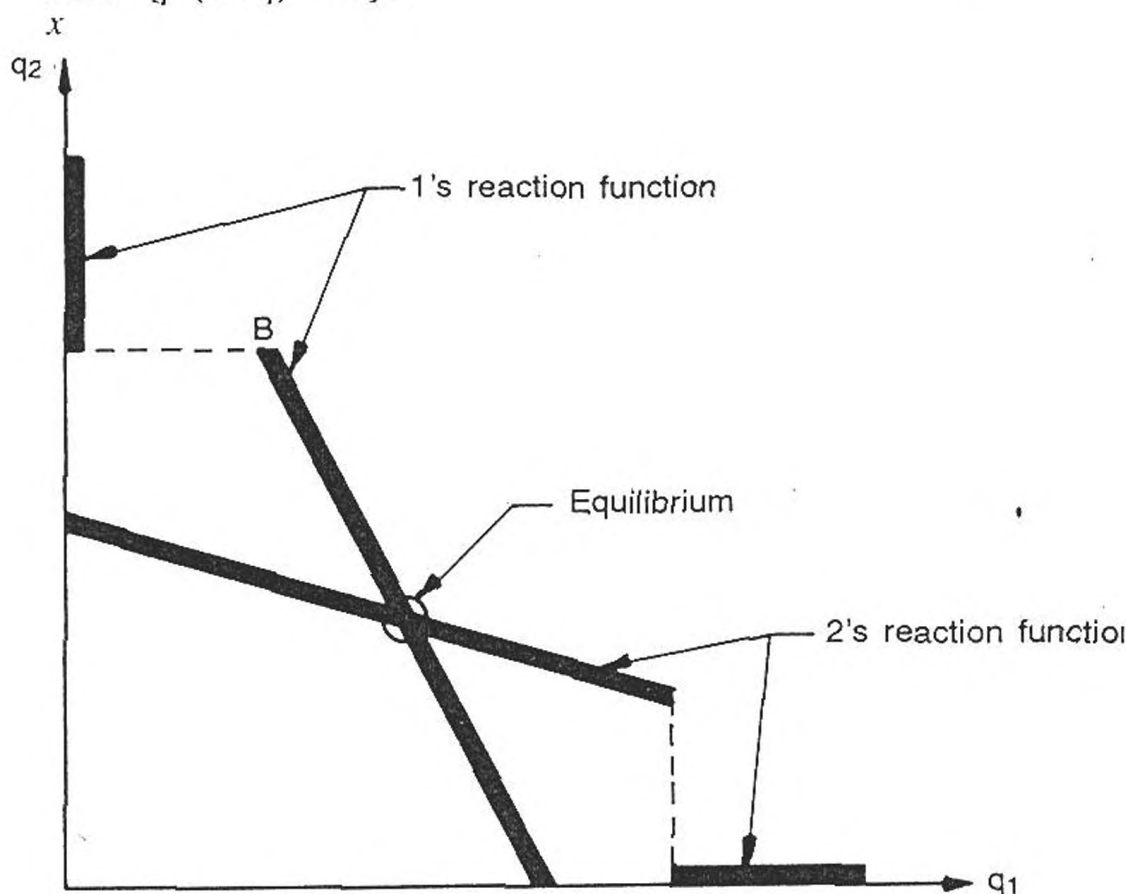
and

$$\pi_2(q_1^*, q_2^*) \geq \pi_2(q_1^*, q_2), \text{ for all } q_2.$$

In other words, (q_1^*, q_2^*) is a Nash equilibrium of the game.

It is easy to check that there is always a unique Nash equilibrium and this happens where q_1 and q_2 are positive. The reaction functions of the two firms are illustrated in Figure 6. The reaction functions have breaks because if total supply in the contested segment becomes too high resulting in too low a price and profit for a firm, say Firm 1, then the firm has the option of withdrawing totally from the contested segment and supplying only to its captive segment, charging monopoly prices. It follows that at point B (in Figure 6), Firm 1's profit is equal to

$$\text{Max}_x [p(x/n_1) - c] x.$$



Given the ubiquitous presence of fragmented markets in developing economies, this method of analysis can be put to a variety of uses. We may do comparative static analysis for changes in the size of captive and contested segments (Basu and Bell, 1991), analyse the effects of various taxes and subsidies on the final industrial outcome, and examine the effects of entry and conditions under which the market gets completely 'balkanized' (Mishra, 1995) or clientelized in the sense of Geertz (1978).

The above model can be moulded to fit many different real-life contexts. If the two Agents 1 and 2 are two moneylenders, for example, the village landlord and the merchant, then this could be thought of as a credit-market model. The landlord's urge to expand his captive segment could then provide a new explanation of interlinkage. Hence, this model can be used to bolster some of the issues discussed earlier.

Under another interpretation, Agents 1 and 2 can be two spatially separated firms, serving different sets of customers S_1 and S_2 , where S_1 and S_2 may have some overlap. Given that products and people are less mobile in underdeveloped countries, models of this kind acquire special significance in such countries. There have also been times when bureaucrats have carved up the market into territories for different producers. There is scope for applying switching cost models in all these contexts.

OF BUREAUCRATS AND BUSINESSMEN

As mentioned earlier, in many developing economies a firm's interaction with the government is the central feature of industrial organization. Hence, the strategic interaction between the owners of private firms and the officials of government ought to be a major concern. The standard literature on industrial organization does not give any primacy to such interaction because this literature emerged mainly from western, industrialized nations, where a *boxwallah*'s major preoccupation is not with the civil servant but with the rival company's *boxwallahs*.⁴

Fortunately a small body of literature which models the government-firm interaction, including some substantial contributions from India, is

⁴ It is arguable, though, that even in industrialized nations the strategic interactions between managers and bureaucrats are more important in reality than has been in the textbooks of economics.

now beginning to emerge. This is important from India's point of view as it is likely to have a significant fall-out for industrial policy-making. While there are many different aspects to the interaction between the private sector and government, I shall comment only on three different ideas.

One way in which the government has intervened in the functioning of industry is through actual participation. Thus, when the government nationalizes some banks it is indulging in participatory regulation. Beginning with the work of Merrill and Schneider (1966), this subject has generated quite a substantial literature (e.g. Sertel, 1988; Cremer et al. 1989; De Fraja and Delbono, 1989; Fershtman, 1990; Sen, 1993). I have surveyed this literature in Basu (1993) and shall only briefly recapitulate the central idea behind these models here.

Suppose we have an industry in which firms 1, ..., n are privately owned, and firms $n + 1$, ..., $n + m$ are state-owned or nationalized. These firms confront the following inverse demand function:

$$p = p(\sum x_r) = a - \sum x_r,$$

where $\sum x_r$ is a summation for $r = 1$ to $r = n + m$.

Let Firm i 's total cost function be given by:

$$c_i = c(x_i), \quad c' > 0, \quad c'' \geq 0$$

where x_i is the amount produced by firm i .

Private firms have the usual profit-maximizing objective.

Hence, for all $i \in (1, \dots, n)$,

$$\pi_i(x) = p(\sum x_r) x_i - c(x_i),$$

where $x = (x_1, \dots, x_{n+m})$.

A state-owned firm, let us assume, maximizes total welfare, that is, the surplus of total welfare increase of consumers over and above the cost of production.

Hence, for all $i \in (n + 1, \dots, n + m)$

$$\pi_i(x) = \int_0^{\sum x_r} p(t) dt - \sum_{r=1}^{n+m} c(x_r)$$

In this model $x^* = (x_1^*, \dots, x_{n+m}^*)$ is an *equilibrium* if and only if it is a Nash equilibrium. That is, if and only if

$$\pi_j(x^*) \geq \pi_j(x^*/x_j), \text{ for all } x_j,$$

where x^*/x_j is a vector of outputs formed by replacing the j^{th} element of x^* with x_j .

For the sake of illustration consider the case where each firm has an identical, linear cost function:

$$c_i = mx_i$$

In this case, in equilibrium each private sector firm will produce nothing and nationalized firms together will produce the competitive output. This, as shown in Basu (1993), is easy to prove. To get some insight into more interesting cases De Fraja and Delbono (1989) have worked with the case where:

$$c_i = kx_i^2/2$$

This allows them to raise interesting questions concerning the welfare effects of nationalization and privatization. They demonstrate, for instance, that in a highly concentrated industry (i.e. $n + m$ small) it is worthwhile to nationalize at least one firm.

In the last few years there has been talk of privatization in India, and some divestiture of public sector enterprises has occurred.⁵ In Asia one of the largest privatization programmes has occurred at India's doorstep. I am referring here to Bangladesh's programme of 1982 (see Bhaskar and Khan, 1993, for a discussion). To date most empirical studies of privatization have dealt with large macro and fiscal issues. This class of theoretical models, however, now, make it possible for us to conduct micro-empirical studies. Observe that in the model just discussed, a fully nationalized industry is simply the special case where $n = 0$. A fully private industry is one where $m = 0$. A process of privatization is one where n increases with $n + m$ remaining constant and nationalization is the reverse move. Hence, by doing comparative statics exercises we may be able to examine the effect of changing n and m on social welfare. The Indian tyre industry with

⁵ This and delicensing are the two central tenets of the New Industrial Policy of July 24, 1991.

its mix of private and state-owned firms is particularly amenable to such analysis.⁶

This will, of course, be just a preliminary exercise since in reality there may be important differences in the internal structures and efficiencies of private and state-owned firms. But this is an area of considerable potential interest to developing, mixed economies, like India.

Another class of bureaucrat-manager models is one where the bureaucrat does not participate as a producer but as a controlling agent with legislative powers to tax and subsidize (Stern, 1987). Some of these are surveyed in Noll (1989) and Braeutigam (1989). Many Indian industries fit this description well. Given that some industries have undergone changes in the regime of government control, they may be suitable for analysing the effects of control. For instance, India's cement industry has been progressively liberalized since 1982 (see Gokarn and Vaidya, 1993), and is an obvious candidate for comparative statics.

Most standard theoretical models analyse interactions between firms and governments by casting the government in the role of a Stackelberg leader. Thus, the bureaucrats are assumed to know the behaviour response of firms to different stimuli and they use this knowledge to set taxes, subsidize, and to regulate in other ways in order to maximize welfare, revenue or whatever it is the bureaucrats maximize.

In Anant et al. (1995), we argue that there may be a case for casting the bureaucrat in a more symmetric strategic position than in the conventional literature. For instance when a government tries to regulate a multinational it is often a one-to-one face off. We tried to model such interactions where the government chooses the tax rate to maximize its revenue collection, while the firm chooses price so as to maximize profit. We begin by analysing the Nash equilibrium of the model and then go on to examine the sub-game perfect equilibria of a two-period model where the firm can select its cost function in the first period, from a feasible set of functions. We show that this model may exhibit 'strategic inefficiency'. That is, it may be in the firm's self-interest to commit itself to a cost function which is everywhere more inefficient than another feasible cost function. Our model, unlike the models of participatory management, can

⁶ The automobile tyre industry is an interesting market in India where the government has repeatedly interacted with big companies in an effort to break concentration and promote competition (Mani 1985).

be particularly useful in explaining the internal cost structures and inefficiencies of firms in a milieu where there is a strategic government trying to control and regulate.

The third class of models of interaction between government and private agents belongs to the domain of corruption control (e.g. Chander and Wilde, 1991; Mookherjee, 1991; Basu et al., 1992; Mishra, 1993, and Mookherjee and Png, 1992). Corruption is typically an activity that emerges—and, indeed, has handsomely emerged—from the interface between the government and profit-maximizing agents. The evasion of taxes—personal income, corporate income and excise—has been a common feature of several economies. This has meant that the instruments of control, like taxes, do not work in reality with as much efficacy as textbook models suggested. While this in itself has been noted for long in the literature, it is only recently that the strategic nature of the interaction between the agents of enforcement and citizens or firms has been modelled. As yet, this literature does not bear directly on industrial organization models but it is an important area for future research. The control of industry by government has chinks created by corruption and the understanding of this is essential for the design of mechanisms of control which are effective.

CONCLUSION

The theory of industrial organization has emerged in recent years as one of the strongest branches of economics. The stylized facts on which this theory is founded are those pertaining to industrialized nations. While a lot of this is relevant to developing countries by virtue of what is innately common to all economies, there are special features of a developing economy which may require special kinds of industrial organization analysis. In India the inadequacy of both theoretical and empirical research on industrial organization has meant that we try to make do with models of industry which fit our institutions rather like ill-fitting readymade clothes.

In recent years some initial steps have been taken in India to do theoretical and empirical work on the microeconomics of industry which is a response to the ground reality. In this paper I have tried to give a glimpse of some of the theoretical research that has taken place and of future possibilities.

REFERENCES

- AHLUWALIA, I. (1985) *Industrial Growth in India: Stagnation Since the Mid-Sixties*, New Delhi: Oxford University Press.
- ANANT, T.C.A., K. BASU, and B. MUKHERJEE (1995) 'A Model of Monopoly with Strategic Government Intervention', *Journal of Public Economics*, forthcoming.
- ATKINSON, A.B. (1994) 'Capabilities, Exclusion and the Supply of Goods', in K. Basu, P.K. Pattanaik, and K. Suzumura, (eds), *Values, Welfare and Development*, Oxford: Clarendon Press, forthcoming.
- BAIN, J. (1956) *Barriers to New Competition*, Cambridge, Mass.: Harvard University Press.
- BARDHAN, P. (1984) *Land, Labour and Rural Poverty*, New York: Columbia University Press.
- (ed.) (1989) *The Economic Theory of Agrarian Institutions*, Oxford: Clarendon Press.
- BARDHAN, P. and A. RUDRA (1978) 'Interlinkage of Land, Labour and Credit Relations: An Analysis of Village Survey Data in East India', *Economic and Political Weekly* 13, Annual Number.
- BASU, K. (1984) *The Less Developed Economy: A Critique of Contemporary Theory*, Oxford and New Delhi: Basil Blackwell and Oxford University Press.
- (1987) 'Disneyland Monopoly, Interlinkage and Usurious Interest Rates', *Journal of Public Economics*, 34 (1), 1–17.
- (1989) 'Technological Stagnation, Tenurial Laws and Adverse Selection', *American Economic Review*, 79, 251–5.
- (1991) 'The International Debt Problem, Credit Rationing and Loan Pushing: Theory and Experience', *Princeton Studies in International Finance*, 70.
- (1993) *Lectures in Industrial Organization Theory*, Oxford: Basil Blackwell.
- BASU, K. and C. BELL (1991) 'Fragmented Duopoly: Theory and Application to Backward Agriculture', *Journal of Development Economics*, 36, 145–65.
- BASU, K., S. BHATTACHARYA and A. MISHRA (1992) 'Notes on Bribery and the Control of Corruption', *Journal of Public Economics*, 48, 349–59.
- BASU, K. and N. SINGH (1990) 'Entry Deterrence' in Stackelberg Perfect Equilibria', *International Economic Review*, 31, 61–71.
- BELL, C. (1989) 'A Comparison of Principal-Agent and Bargaining Solutions: The Case of Tenancy Contracts', in Bardhan (1989).
- BHARADWAJ, K. (1974) *Production Conditions in Indian Agriculture*, Cambridge: Cambridge University Press.

- BHASKAR, V. and M. KHAN (1993) 'Privatization and Employment: A Study of the Jute Industry in Bangladesh', (mimeo.), Delhi School of Economics.
- BOWMAN, W.S. (1957) 'Tying Arrangements and the Leverage Problem', *Yale Law Journal*, 67.
- BRAEUTIGAM, R.R. (1989) 'Optimal Policies for Natural Monopolies', in Schmalensee and Willig (1989).
- BRAVERMAN, A. and J. STIGLITZ (1982) 'Sharecropping and the Interlinking of Agrarian Markets', *American Economic Review*, 72, 695-715.
- BRESNAHAN, T.F. (1989) 'Empirical Studies of Industry with Market Power', in Schmalensee and Willig (1989).
- BULOW, J.I. and K. ROGOFF (1989) 'Sovereign Debt: Is to Forgive to Forget?', *American Economic Review*, 79, 43-50.
- CHANDER, P. and L. WILDE, (1991) 'Corruption and Tax Compliance', (mimeo.), New Delhi: Indian Statistical Institute.
- CHANDRA, N. (1977) 'Monopoly Legislation and Policy in India', *Economic and Political Weekly* (Special Issue), 12, 1405-18.
- CREMER, H., M. MARCHAND, and J.F. THISSE, (1989) 'The Public Firm as an Instrument for Regulating an Oligopolistic Market', *Oxford Economic Papers*, 41, 283-301.
- DE FRAJA, G. and F. DELBONO, (1989) 'Alternative Strategies of a Public Enterprise in Oligopoly', *Oxford Economics Papers*, 41, 302-11.
- DESHPANDE, A. (1994) 'Some Aspects of International Debt,' Ph.D. thesis, Delhi University.
- DIXIT, A. (1980) 'The Role of Investment in Entry-deterrence', *Economic Journal*, 90, 95-106.
- DREZE, J. and A. SEN (1989) *Hunger and Public Action*, Oxford: Clarendon Press.
- DUTTA, B., D. RAY and K. SENGUPTA, (1989) 'Contracts with Eviction in Infinitely Repeated Principal Agent Relationships', in Bardhan (1989).
- FRESHTMAN, C. (1990) 'The Interdependence between Ownership Status and Market Structure: The Case of Privatization,' *Economica*, 57, 319-28.
- GABSZEWICZ, J.J. and J.F. THISSE (1979) 'Price Competition, Quality and Income Disparities', *Journal of Economic Theory*, 20, 340-59.
- GEERTZ, C. (1978), 'The Bazaar Economy: Information and Search in Peasant Marketing', *American Economic Review*, 68, 28-37.
- GOKARN, S. and R. VAIDYA (1993) 'Deregulation and Industrial Performance : The Indian Cement Industry', *Economic and Political Weekly (Review of Industry and Management)*, 28, M33-M41.
- GOSWAMI COMMITTEE REPORT (1993) *Report of the Committee on Industrial Sickness and Corporate Restructuring*, Ministry of Finance, Government of India.
- GUENAUULT, P. and J. JACKSON (1960) *Control of Monopoly in the United Kingdom*, London: Longman.

- JOSEPH, K.J. (1994) 'Industrial Growth, Productivity and Competitiveness under Structural Adjustment in India: A Survey of Recent Studies and Issues for Research'. (mimeo.), Trivandrum: Centre for Development Studies.
- KABIRAJ, T. and S. MARJIT, (1993) 'International Technology Transfer under Potential Threat of Entry: A Cournot-Nash Framework', *Journal of Development Economics*, 42, 75-88.
- KLEMPERER, P. (1987) 'Markets with Consumer Switching Costs', *Quarterly Journal of Economics*, 102, 375-94.
- LOURY, G. (1979) 'Market Structure and Innovation', *Quarterly Journal of Economics*, 93, 395-410.
- MANI, S. (1985) 'Concentration and Market Power in Indian Automotive Tyre Industry', *Economic and Political Weekly (Review of Management)*, 20, M53-M64.
- MARJIT, S. (1990) 'On a Non-Cooperative Theory of Technology Transfer', *Economics Letters*, 33, 293-8.
- MERRILL, W.C. and N. SCHNEIDER (1966) 'Government Firms in Oligopoly Industries: A Short-run Analysis', *Quarterly Journal of Economics*, 80, 400-12.
- MISHRA, A. (1993) 'Market Equilibria, Social Institutions and Informational Uncertainty', Ph.D. thesis, Delhi University.
- MISHRA, A. (1995) 'Clientelization and Fragmentation in Backward Agrarian Markets', (mimeo.) Delhi School of Economics, (also forthcoming in *Journal of Development Economics*).
- MOHAN, R. (1992) 'Industrial Policy and Controls', in B. Jalan (ed.) *The Indian Economy: Problems and Prospects*, New Delhi: Penguin India.
- MOOKHERJEE, D. (1991) 'The Economics of Enforcement', (mimeo.) New Delhi: Indian Statistical Institute.
- MOOKHERJEE, D. and I. PNG (1992) 'Corruptible Law Enforcers: How Should They Be Compensated?' *Economic Journal*, forthcoming.
- NOLL, R.G. (1989) 'Economic Perspectives on the Politics of Regulation', in Schmalensee and Willig (1989).
- PARANJPE, H.K. (1986) 'The Monopolies and Restrictive Trade Practices Act: A Review 1970-83', in S. Guhan and H. Shroff (eds), *Essays in Economic Progress and Welfare*, Delhi: Oxford University Press.
- REINGANUM, J. (1989) 'The Timing of Innovation', in Schmalensee and Willig (1989).
- ROWLEY, C.K. (1966) *British Monopolies Commission*, London: Allen and Unwin.
- SCHMALENSEE, R. (1989) 'Inter-Industry Studies of Structure and Performance', in Schmalensee and Willig (1989).
- SCHMALENSEE, R. and R. WILLIG, (eds) (1989) *Handbook of Industrial Organization*, Amsterdam: North Holland.

- SEN, A. (1993) 'Entry and Managerial Incentives', *International Journal of Industrial Organization*, forthcoming.
- SERTEL, M. (1988) 'Regulation by Participation', *Journal of Economics*, 48.
- SHAKED, A. and J. SUTTON (1983) 'Natural Oligopolies', *Econometrica*, 51, 1469-83.
- SINGH, N. (1994) 'Some Aspects of Technological Change and Innovation in Agriculture', in K. Basu (ed.), *Agrarian Questions*, Delhi: Oxford University Press.
- STERN, N. (1987) 'The Effects of Taxation, Price Control and Government Contracts in Oligopoly and Monopolistic Competition', *Journal of Public Economics*, 32, 133-58.
- VON WEIZSACKER, C. (1984) 'The Costs of Substitution', *Econometrica*, 52, 1085-116.
- WHARTON, L.R. (1962) 'Marketing, Merchandising and Moneylending: A Note on Middlemen Monopoly in Malaya', *Malayan Economic Review*, 7.